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CAMI: WEB-BASED APPLICATION TO TEST VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENTS

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Abstract. Testing research instruments can be done using several applications such as SPSS, AMOS, Lisrell, and several other applications. However, the use of these applications encounters several obstacles for its users, the first is that some of these applications are paid, the costs that are not small to buy a license for this application often force users to use a pirated version of the application, which of course is detrimental for developers and tarnish the world of education itself. And the second is that the use of this application sometimes confuses the users, the cause is that the items in the application are too complex, making it difficult to use, and in some applications, there are demands that users have an understanding of programming to be able to use the application. Therefore, in this research, a web-based application was developed to test the validity and reliability of research instruments that are free of charge and easy to use by academics and researchers (this application is then called CAMI). The stages taken in this research are the study of the theory of testing the validity and reliability of the research instrument, collecting data, compiling the syntax for making applications, installing applications on a web server (so that they can be accessed online), and testing applications from the data obtained. The data used in this research is secondary data obtained from theses and journals. Furthermore, the data is used to test the web application that has been created, then the results of the test data output are compared with the test results using the SPSS application with the same data. From the test results, it was found that both validity and reliability tests gave the same output 100% as the SPSS application.

Keywords**:** Instrument; Validity; Reliability; Web-Based Application

I. INTRODUCTION

Information technology is not difficult to obtain at this time, because it has entered all lines of community life (Hendarsyah, 2019). Universities in Indonesia are required to be able to anticipate the increasingly rapid progress of globalization and technological developments that occur in the era of the industrial revolution 4.0 (Iswan & Herwina, 2018; Wibawa & Agustina, 2019). The use of internet networks in Indonesia has developed very rapidly (Paduppai et al., 2019). There is no reason for today's generation not to understand technology. The illiteracy terminology in the 1990s is someone unable to read and write, while in the industrial revolution version 4.0 illiteracy terminology is someone unable to use technology properly. In today's digital era, technology has an important role in improving the quality of education.

One of the uses of technology that has been widely used and very helpful is statistical data processing applications. Some of these applications that are often used include SPSS, AMOS, and Lisrell. In education, one of the uses of these applications is to test the validity and reliability of research instruments. This test is very important to do to ensure that the research results obtained are scientifically acceptable and accountable.

The research instrument was a written guideline for interviews, observations, and questions that were prepared to obtain information. This statement is in line with Gulo (2002) which stated that the instrument is called an observation guide, interview, questionnaire, or documentary guide according to the method used. Likewise, according to Sappaile (2007), the instrument is a tool that meets academic requirements so that it can be used as a tool to measure a measuring object or collect data about a variable. Whether a research instrument is good or not is determined by its validity and reliability (Yusup, 2018). Therefore, researchers should use quality instruments, because it can result in low validity and reliability, and has a

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level of difficulty, differentiation, and distracting/distracting power, so the data obtained is also invalid or not following the facts in the field, so it can yield wrong conclusions (Arifin, 2017).

Validity comes from the word validity which means the extent to which the accuracy and accuracy of a measuring instrument in performing its measuring function (Wahyudi, 2020). In other literature, it is stated that the validity of a test kit can be defined as the ability of a test to measure what should be measured (Arifin, 2017). The validity of the instrument takes into account the extent to which the measurement is precise in measuring what is to be measured, the instrument is said to be valid when it can reveal data from the variable accurately does not deviate from the actual situation (Yusup, 2018).

Reliability is the translation of the word reliability which has the origin of the word Rely and ability (Wahyudi, 2020). Measurements that have high reliability are called reliable measurements. Reliability is a term used to indicate the extent to which a measurement result is relatively consistent if the measurement is repeated two or more times. The instrument is said to be reliable when it can reveal reliable data (Arikunto, 2010). The test is said to be reliable if the observed score has a high correlation with the actual score (Arifin, 2017). According to Sugiyono (2014), the factors that affect the validity and reliability of a measuring instrument (instrument) other than the instrument are users of measuring instruments who take measurements and the subject being measured.

A web-based application is an application that can be accessed using a web browser or web browser via an internet network. The advantages of web-based applications, among others are first, it does not require a license when using web-based applications because the license is the responsibility of the application service provider (Hatmoko, 2019). Second, it does not require high specifications to perform and use web applications. Third, can be run anywhere and anytime without having to install. Fourth, can be used in various types of operating systems. Fifth, can be accessed through many media such as computers, laptops, and smartphones.

Testing research instruments can be done using several applications such as SPSS, AMOS, Lisrell, and several other applications. However, the use of these applications encounters several obstacles for its users, the first is that some of these applications are paid, the costs that are not small to buy a license for this application often force users to use a pirated version of the application, which of course is detrimental for developers and tarnish the world of education itself. And the second is that the use of this application sometimes confuses the users, the cause is that the items in the application are too complex, making it difficult to use, and in some applications, there are demands that users have an understanding of programming to be able to use the application.

Based on this condition, it is necessary to design an application that is free of charge and easy to use. Therefore, in this research, a web-based application was developed to test the validity and reliability of research instruments that are free of charge and easy to use by academics and researchers. The advantage of using a web-based application is that it can be accessed online anytime and anywhere, so there is no need to install devices such as data processing applications in general (Ulhaq, 2014), that this application is designed to be used on all types of Android smartphones.

In this research, application development focuses on what types of instruments will be displayed in the application and how to arrange the menu in the application so that it is easy for users to operate, and ensures that the data processing output of the application has a high level of similarity with other applications (in terms of this, the output is compared to SPSS). Also, it must be guaranteed that the developed web-based application can be accessed properly online using either a laptop or other devices in almost all web browsers used, especially Google Chrome, Mozilla Firefox, Internet Explorer, and Opera. Those main focuses are the guideline for achieving the objectives of this research.

II. Methodology

This research is basic research with the results of research in the form of web-based application products. The data used in this study are secondary data from theses and journals. Furthermore, the data is used to test the web application created. The indicator of the success of this research is the creation of a product in the form of an application system that can be accessed online and the results of instrument testing obtained from the web application have the same output or are not much different from other data processing applications (in this case the comparison is using SPSS 18).

The steps taken in this research are the study of the theory of testing the validity and reliability of the research instrument, collecting data, compiling the syntax for making applications, installing applications on a web server (so that they can be accessed online), and testing applications from the data obtained. At first, the data collected was in the form of thesis and journal data. The data is tested first on the SPSS application. Furthermore, the data is also tested on Web-based applications to see the differences between these applications. Then the next data collected is manual data made by the researchers themselves. The data made by the researcher will be tested such as thesis or journal data. After both data had been tested for validity and reliability several times, the researcher recapitulated all comparisons of these applications. Web-based applications are said to be suitable for use if the test results prove that these applications have the same output or have differences that are not too high.

III. Results and Discussion

From the results of developing this web-based application, an application to test the validity and reliability of the research instrument is obtained (can be accessed at http://cami.my.id/) and has the main features as shown in Fig. 1.

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Fig. 1 The main page of the CAMI application

As seen from Fig. 1, there are 4 tools or menus which refer to the types of instruments by Sugiyono (2016) that can be used in this application to test the validity and reliability of the instrument, namely:

1) *Multiple Choice Test Menu*: This menu is used to test the validity and reliability of the multiple-choice test instrument. In this menu, users only need to input data such as name, respondent's answer, and answer key to be processed automatically by the application and will give the results of the validity and reliability test of the instrument. Example calculations will be given later.

2) *Essay Test Menu*: This menu is used to test the validity and reliability of the essay test instrument. In this menu, the user simply enters the name and test result data of the respondent, which is then processed automatically by the application and will give the results of the validity and reliability test of the instrument.

3) *Questionnaire menu (Likert scale)*: This menu is used to test the validity and reliability of the instrument in the form of a questionnaire that uses a Likert scale. In this menu, the user enters the name and the results of the respondent's responses in the form of categorical data in the range 1 to 5, from disagreeing to strongly agreeing, or in a different context, which is then processed automatically by the application and will give the results of the validity and reliability test of the instrument.

4) *Questionnaire menu (Guttman scale)*: This menu is used to test the validity and reliability of the instrument in the form of a questionnaire using the Guttman scale. Similar to the Likert scale questionnaire menu, on this menu, the user enters the name and the results of the respondent's response in the form of categorical data, but with different ranges, namely 0 and 1, this is in the form of 'yes' or 'no' responses, or other contexts, then from this data will be processed automatically by the application and will give test results of the validity and reliability of the instrument. The menu for the instrument test in the form of a questionnaire is distinguished because the formulas used in the two menus are different.

One of the results of the data testing trial (an instrument in the form of a questionnaire with a Likert scale) using CAMI which is then compared with the test results using SPSS with the same data can be seen in Fig. 2 to Fig. 7.

Fig. 2 is the result of data input in the CAMI application, and Fig. 3 is the result of the same data input in the SPSS application. The number of respondents on the data is 10 people with 7 items used in the instrument.

In Fig. 4, the results of the validity test using CAMI are given, and in Fig. 5 are the results of the validity test using SPSS. From these two results, the same calculation results are obtained 100% (shown in the red block given). The two results of these calculations provide the same correlation value. So when referring to Sugiyono (2014), from the results of data processing using both CAMI and SPSS it is concluded that all items are valid, because all the correlation values (r) are greater than 0.3.

Furthermore, the reliability test results can be seen in Fig. 6 using CAMI and in Fig. 7 using SPSS. From the results of the output of the two applications, it turns out that it also gives the same 100% result, namely 0.78. So that if we refer back to Sugiyono (2014), then from the results of data processing using both CAMI and SPSS it is concluded that the instrument is reliable because the value of the Alpha Cronbach is more than 0.6.

From the above results, it is concluded that CAMI can be used as an alternative to testing instruments other than SPSS. So, the target of this research was achieved, namely developing web-based applications that can be an alternative to testing the validity and reliability of research instruments that can be accessed by anyone without having to pay or buy an application license.

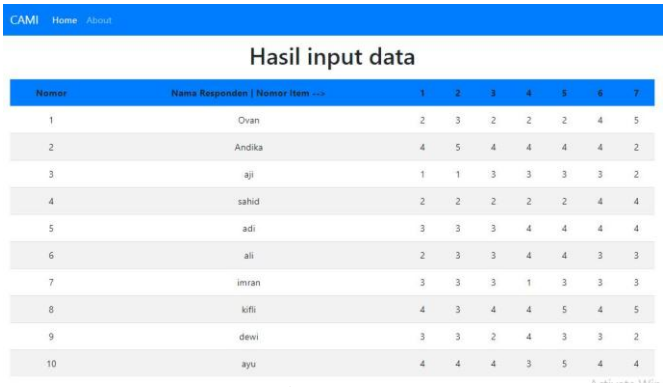

Fig. 2 Results of data input on CAMI

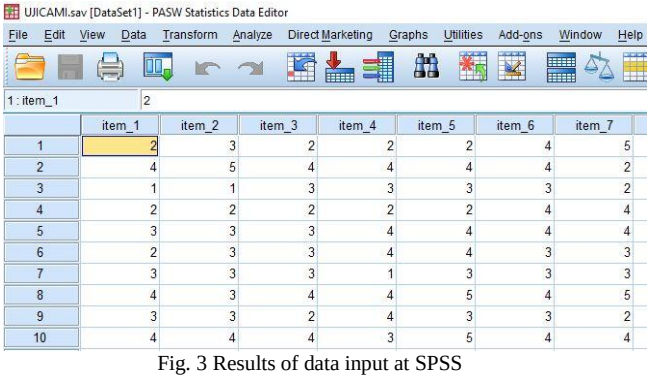

Fig. 3 Results of data input at SPSS

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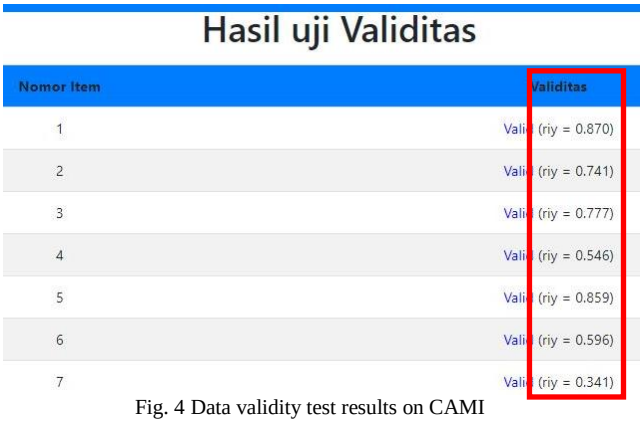
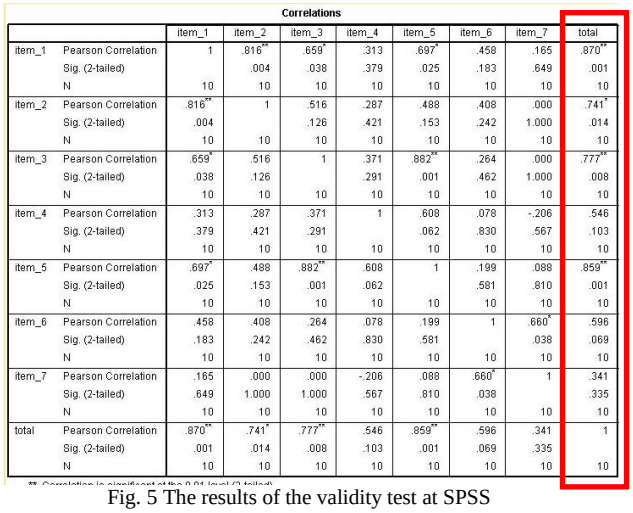


Hasil uji Validitas

Nomor Item	Validitas
1	Valid (riy = 0.870)
2	Valid (riy = 0.741)
3	Valid (riy = 0.777)
4	Valid (riy = 0.546)
5	Valid (riy = 0.859)
6	Valid (riy = 0.596)
7	Valid (riy = 0.341)

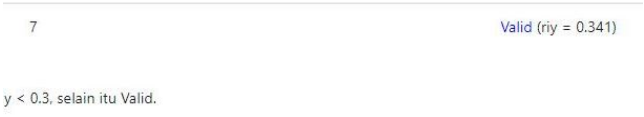
Fig. 4 Data validity test results on CAMI



Correlations

		item_1	item_2	item_3	item_4	item_5	item_6	item_7	total
item_1	Pearson Correlation	1	.816**	.659*	.313	.697*	.458	.165	.870**
	Sig. (2-tailed)		.004	.038	.379	.025	.183	.649	.001
	N	10	10	10	10	10	10	10	10
item_2	Pearson Correlation	.816**	1	.516	.287	.488	.408	.000	.741*
	Sig. (2-tailed)	.004		.126	.421	.153	.242	1.000	.014
	N	10	10	10	10	10	10	10	10
item_3	Pearson Correlation	.659*	.516	1	.371	.882**	.264	.000	.777**
	Sig. (2-tailed)	.038	.126		.291	.001	.462	1.000	.008
	N	10	10	10	10	10	10	10	10
item_4	Pearson Correlation	.313	.287	.371	1	.608	.078	-.206	.546
	Sig. (2-tailed)	.379	.421	.291		.062	.830	.567	.103
	N	10	10	10	10	10	10	10	10
item_5	Pearson Correlation	.697*	.488	.882**	.608	1	.199	.088	.859**
	Sig. (2-tailed)	.025	.153	.001	.062		.581	.810	.001
	N	10	10	10	10	10	10	10	10
item_6	Pearson Correlation	.458	.408	.264	.078	.199	1	.660*	.596
	Sig. (2-tailed)	.183	.242	.462	.830	.581		.038	.069
	N	10	10	10	10	10	10	10	10
item_7	Pearson Correlation	.165	.000	.000	-.206	.088	.660*	1	.341
	Sig. (2-tailed)	.649	1.000	1.000	.567	.810	.038		.335
	N	10	10	10	10	10	10	10	10
total	Pearson Correlation	.870**	.741*	.777**	.546	.859**	.596	.341	1
	Sig. (2-tailed)	.001	.014	.008	.103	.001	.069	.335	
	N	10	10	10	10	10	10	10	10

Fig. 5 The results of the validity test at SPSS



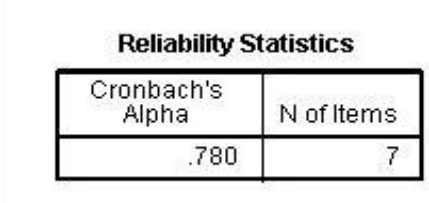
7 Valid (riy = 0.341)

y < 0.3, selain itu Valid.

Hasil uji Reliabilitas

Nilai reliabilitas instrumen ini adalah alfa = 0.78, yang berarti instrumen anda Reliabel.
*Keterangan: Tidak Reliabel jika alfa < 0.6, selain itu Reliabel.

Fig. 6 Reliability test results on CAMI



Reliability Statistics

Cronbach's Alpha	N of Items
.780	7

Fig. 7 Reliability test results at SPSS

IV. Conclusions

Based on the results and discussion, it is concluded that a web-based application to test the validity and reliability of research instruments has been successfully created, and the test results obtained from this application have the same output as other data processing applications (SPSS). Thus, this application can be used to test the validity and reliability of research instruments and is freely accessed online.

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